

**IN THE UNITED STATES DISTRICT COURT  
FOR THE EASTERN DISTRICT OF TEXAS  
MARSHALL DIVISION**

VOCALIFE LLC,

Plaintiff,

V.

AMAZON.COM, INC. and  
AMAZON.COM LLC,

Defendants.

Case No. 2:19-cv-123

## JURY TRIAL DEMANDED

## COMPLAINT FOR PATENT INFRINGEMENT

Plaintiff Vocalife LLC (“Vocalife” or “Plaintiff”), for its Complaint against Defendants Amazon.com, Inc. and Amazon.com LLC (collectively, “Amazon” or “Defendants”), for patent infringement under 35 U.S.C. § 271 alleges as follows:

## THE PARTIES

1. Vocalife is a limited liability company organized and existing under the laws of the State of Texas, with its principal place of business located at 7300 Lone Star Drive, C200 Plano, TX 75024.

2. Upon information and belief, Defendant Amazon.com, Inc. is a corporation organized and existing under the laws of the State of Delaware, with its principal place of business located at 410 Terry Avenue North, Seattle, WA 98109-5210.

3. Upon information and belief, Defendant Amazon.com LLC is a corporation organized and existing under the laws of the State of Delaware, which is headquartered at 410 Terry Avenue North, Seattle, WA 98109-5210.

4. Upon information and belief, Amazon.com, Inc. is the ultimate parent of Amazon.com LLC. Amazon is a leading manufacturing and seller of virtual assistant smart speakers in the world and in the United States.

### **JURISDICTION**

5. This is an action for patent infringement arising under the patent laws of the United States, 35 U.S.C. §§ 1, *et seq.* This Court has jurisdiction over this action pursuant to 28 U.S.C. §§ 1331 and 1338(a).

6. This Court has personal jurisdiction over Amazon. Amazon regularly conducts business and has committed acts of patent infringement and/or has induced acts of patent infringement by others in this District and/or has contributed to patent infringement by others in this District, the State of Texas, and elsewhere in the United States.

7. Venue is proper in this judicial district pursuant to 28 U.S.C. §§ 1391 and 1400(b) because, among other things, upon information and belief Amazon maintains regular and established physical places of business in Texas and in the Eastern District of Texas, directly or through intermediaries.

8. Amazon has admitted that it operates an Amazon Fulfillment Center within this District.<sup>1</sup>

9. Amazon has admitted that it employs information technology personnel at its Fulfillment Center in Denton County, which is in this District.<sup>2</sup>

10. Upon information and belief, Amazon, by itself and/or through its subsidiaries, operates one or more “Fulfillment Centers” within this Judicial District including, at least, a Fulfillment Center located in Denton County at 15201 Heritage Parkway, Fort Worth, TX 76177.

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<sup>1</sup> See Exhibit A at ¶¶ 7 and 16.

<sup>2</sup> *Id.* at ¶ 20.

11. Upon information and belief, Amazon has a regular and established place of business in this Judicial District, including, at least, a distribution facility located at 1649 W. Frankford Road, Carrollton, TX 75007, Amazon “lockers,” employees, and other business.

12. Upon information and belief, Amazon has property in Denton County appraised on the property tax rolls by Denton County at \$536,994.00<sup>3</sup> and \$178 million.<sup>4</sup> Amazon and/or its subsidiaries employ individuals within this Judicial District responsible for the distribution of its products including those accused of infringement below.

13. Amazon offers its products and/or services, including those accused of infringement below, to customers and potential customers located in Texas and in this District.

14. Amazon is subject to personal jurisdiction in this District, has a regular and established place of business in this District including Amazon Fulfillment Centers in this District and throughout Texas, has purposely transacted business involving the accused products in this District, has purposely transacted business involving the accused products in this District, including sales to one or more customers in Texas, has employees in this District, and certain of the acts complained of herein occurred in this District.

15. Amazon is subject to this Court’s jurisdiction pursuant to due process and/or the Texas Long Arm Statute due at least to its substantial business in this State and District, including (a) at least part of its past infringing activities, (b) regularly doing or soliciting business in Texas, and/or (c) engaging in persistent conduct and/or deriving substantial revenue from goods and services provided to customers in Texas.

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<sup>3</sup> <https://www.dentoncad.com/api/export/pdf/details/659411?year=2018>.

<sup>4</sup> <https://www.dentoncad.com/api/notices/notice/699143?year=2018>;  
<https://blog.taxjar.com/amazon-warehouse-locations/>;  
<https://www.amazon.com/b?ie=UTF8&node=6442600011>

**PATENT-IN-SUIT**

16. On October 14, 2014, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. 8,861,756 (the “’756 Patent”) entitled “Microphone Array System.” A true and correct copy of the ’756 Patent attached hereto as Exhibit B.

17. On October 14, 2016, a reissue application was filed for the ’756 Patent. As a result, on September 18, 2018, the United States Patent and Trademark Office duly and legally issued U.S. Patent No. RE47,049 (the “’049 Patent”) entitled “Microphone Array System.” A true and correct copy of the ’049 Patent is attached hereto as Exhibit C.

18. Vocalife is the sole and exclusive owner of all right, title, and interest in the ’049 Patent, and holds the exclusive right to take all actions necessary to enforce its rights to the ’049 Patent, including the filing of this patent infringement lawsuit. Vocalife also has the right to recover all damages for past, present, and future infringement of the ’049 Patent and to seek injunctive relief as appropriate under the law.

19. Vocalife has at all times complied with the marking provisions of 35 U.S.C. § 287 with respect to the ’049 Patent. On information and belief, prior assignees and licensees have also complied with the marking provisions of 35 U.S.C. § 287.

**FACTUAL ALLEGATIONS**

20. The ’049 Patent was developed at Li Creative Technologies Inc. by Dr. Manli Zhu and Dr. Qi Li. Dr. Li has been at the forefront of audio processing technology for over two decades. In the late 2000’s Dr. Li and Dr. Zhu worked to develop novel audio, speech, and image processing technology, including circular microphone arrays. Their work resulted in the issuance of the ’049 Patent.

21. In 2011, Dr. Li participated in the Consumer Electronics Show (“CES”) where

they were awarded the CES Innovations Design and Engineering Award in the Audio Accessories Category.

22. On or about September 20, 2011, Jerry Wu from A2Z Development Center, Inc., d/b/a Lab 126 (“Lab 126”), the hardware design arm of Defendant Amazon, reached out to Dr. Li expressing interest in the 3D audio, noise and echo cancellation technology and, in particular, adaptive beamforming technology.

23. On or about October 17, 2011, Dr. Li accepted an invitation by Lab 126 and met with at least Aleksandar Pance and Matthew Holland from Lab 126 (the “Meeting”). At the Meeting, Dr. Li performed a confidential demonstration and presented the invention including a circular microphone array, 3D sound, acoustic echo cancellations, and sound source localization, including both hardware and software. Dr. Li also confidentially introduced the concept of using voice and cloud computation to search music as one of the applications of the microphone array technology.

24. Dr. Li contacted Lab 126 to follow-up on the Meeting on or about June 22, 2012 and December 11, 2014; however, Dr. Li did not receive a response to his emails during this timeframe.

25. The ’049 Patent generally covers systems and methods for use in a microphone array system. The invention described in the ’049 Patent was developed by Manli Zhu and Qi Li. For example, the invention is implemented by infringing virtual assistant smart speakers utilizing Amazon “Alexa” Technology. Upon information and belief, Amazon makes, uses, sells, and/or imports infringing virtual assistant smart speakers, such as the Amazon Echo products.

26. Amazon has also infringed and is continuing to infringe the ’049 Patent by

making, using, selling, offering to sell, and/or importing, and by actively inducing others to make, use, sell, offer to sell, and/or importing, products including microphone array systems technology and associated software that infringes the '049 Patent. Such products include at least the Amazon Alexa-enabled products including, but not limited to, the Amazon Echo products.

27. Vocalife manufactures and sells the CrispMic II, a smart microphone as a module for voice interactive products. The CrispMic II is a multiple-microphone array module for smart speakers, robotic devices, smart appliances, and other IoT platforms that require far-field voice capture, speech recognition, and voice control. The CrispMic II is powered by Vocalife's advanced DSP algorithms developed over the past decade to suppress background noise, enhance speech intelligibility, and improve automatic speech recognition accuracy.<sup>5</sup>

28. Vocalife marks the CrispMic II product with the '049 Patent and has complied with 35 U.S.C. § 287.<sup>6</sup>

**COUNT I**  
**(Infringement of the '049 Patent)**

29. Paragraphs 1 through 28 are incorporated by reference as if fully set forth herein.

30. Vocalife has not licensed or otherwise authorized Amazon to make, use, offer for sale, sell, or import any products that embody the inventions of the '049 Patent.

31. Amazon has directly infringed and continues to directly infringe the '049 Patent, either literally or under the doctrine of equivalents, without authority and in violation of 35 U.S.C. § 271, by making, using, offering to sell, selling, and/or importing into the United States products that satisfy each and every limitation of one or more claims of the '049 Patent. Such products include virtual assistant smart speakers and other hardware and software implementing

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<sup>5</sup> [https://vocalife.com/wp-content/uploads/2019/02/Farfield\\_Mic\\_Developer\\_Module\\_Vocalife\\_Datasheet\\_4Feb2019.pdf](https://vocalife.com/wp-content/uploads/2019/02/Farfield_Mic_Developer_Module_Vocalife_Datasheet_4Feb2019.pdf)

<sup>6</sup> *Id.*

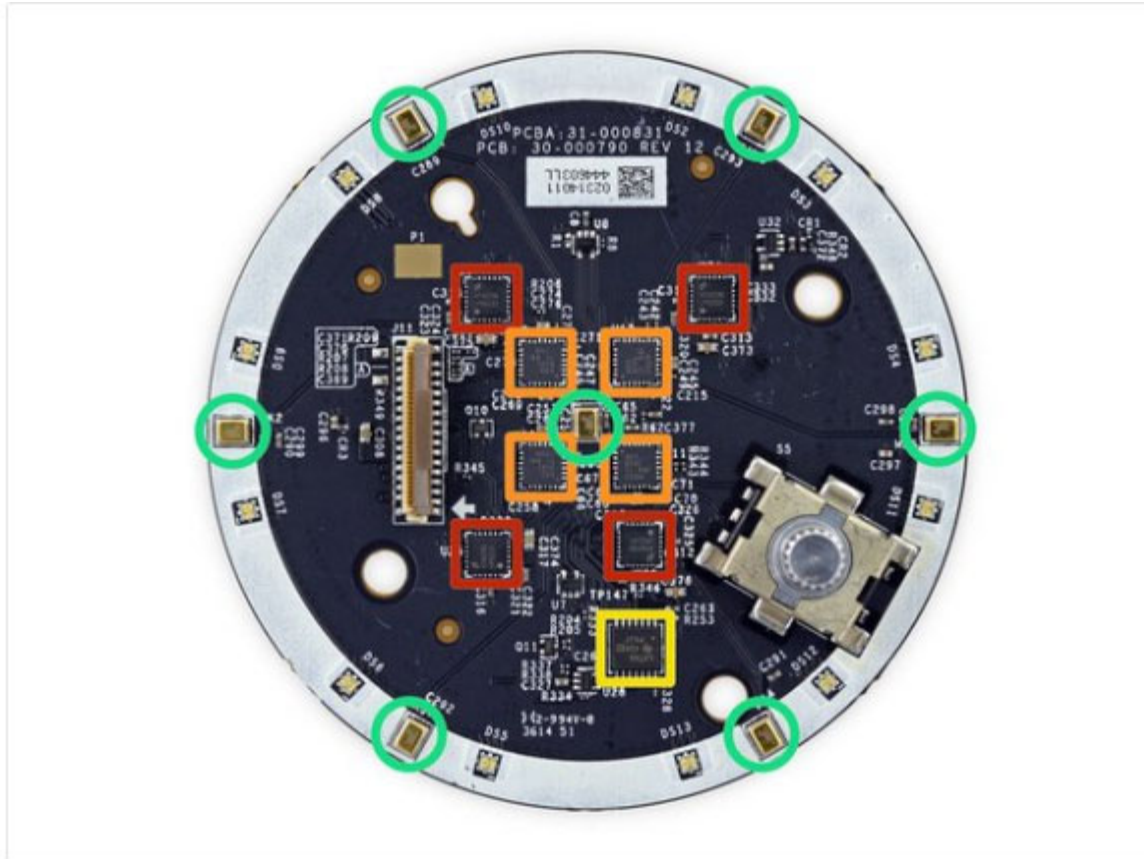
a microphone array system. On information and belief, infringing products include at least the Alexa enabled products, such as the Amazon Echo products.

32. For example, Amazon has and continues to directly infringe at least claim 1 of the '049 Patent by making, using, offering to sell, selling, and/or importing into the United States virtual assistant smart speakers that utilize a microphone array system.

33. Upon information and belief, the Amazon Echo products include a microphone array which is an array of sound sensors positioned in an arbitrary a linear, circular, or other configuration, wherein said sound sensors receive said sound signals from a plurality of disparate sound sources, wherein said received sound signals comprise said target sound signal from a target sound source among said disparate sound sources, and ambient noise signals. An image of Amazon's Echo product is shown below:<sup>7</sup>

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<sup>7</sup> <https://www.ifixit.com/Teardown/Amazon+Echo+Teardown/33953>; Annotations in the image originate from <https://www.ifixit.com/Teardown/Amazon+Echo+Teardown/33953>. Green circles indicate the microphones located in Amazon's Echo product.



34. Upon information and belief, the Amazon Echo products include a digital signal processor, such as digital signal processors (“DSP”), manufactured by third parties including Texas Instruments, MediaTek, and AMLogic.

35. Upon information and belief, the DSPs included in the Amazon Echo products include a sound source localization unit that estimates a spatial location of said target sound signal from said received sound signals, by determining a delay between each of said sound sensors and an origin of said array of said sound sensors as a function of distance between each of said sound sensors and said origin, a predefined angle between each of said sound sensors and a reference axis, and an azimuth angle between said reference axis and said target sound signal, when said target sound source that emits said target sound signal is in a two dimensional plane, wherein said delay is represented in terms of number of samples, and wherein said determination



of said delay enables beamforming for arbitrary numbers of said array of sound sensors and in a plurality of arbitrary configurations of said array of said sound sensors.<sup>8</sup>

36. Upon information and belief, the DSPs included in the Amazon Echo products include an adaptive beamforming unit that steers directivity pattern of said array of said sound sensors in a direction of said spatial location of said target sound signal, wherein said adaptive beamforming unit enhances said target sound signal and partially suppresses said ambient noise signals.<sup>9</sup> An image of Amazon Echo's sound source localization unit is shown below:<sup>10</sup>



37. Upon information and belief, the DSPs included in the Amazon Echo products

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<sup>8</sup> <https://developer.amazon.com/docs/alexa-voice-service/audio-hardware-configurations.html#hardware>.

<sup>9</sup> *Id.*

<sup>10</sup> <https://thewirecutter.com/reviews/amazon-echo-vs-google-home/>; The beamforming technology is indicated by the light ring in Amazon Echo products which will turn solid blue upon hearing the “wake word” or when it is manually awoken, and a small section of the light ring will turn cyan and point in the direction of the sound. *See* <https://www.amazon.com/gp/help/customer/display.html?nodeId=201601790>; *see also* <https://www.cnet.com/how-to/light-ring-colors-amazon-echo-alexa/>.

include a noise reduction unit that suppresses said ambient noise signals for further enhancing said target sound signal.

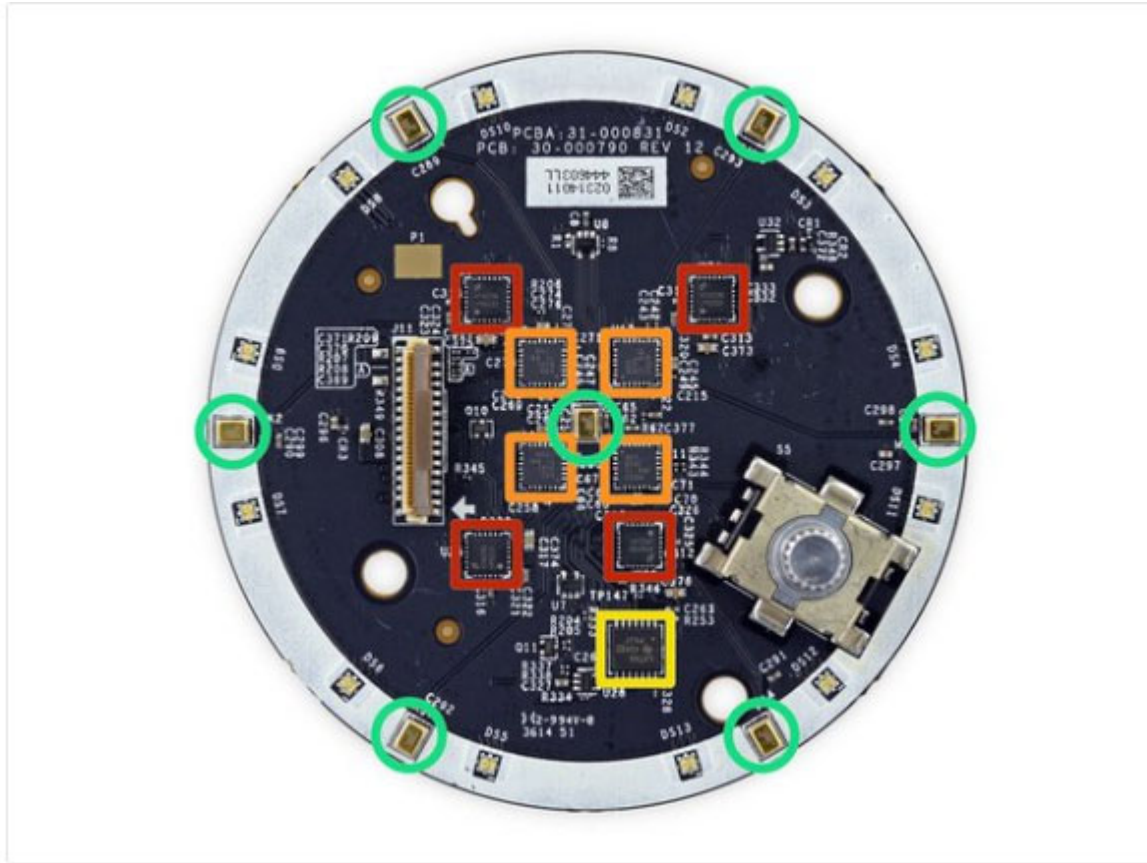
38. Amazon has and continues to indirectly infringe one or more claims of the '049 Patent by knowingly and intentionally inducing others, including Amazon customers and end-users, to directly infringe, either literally or under the doctrine of equivalents, by making, using, offering to sell, selling and/or importing into the United States products that include infringing technology such as virtual assistant smart speakers that utilize a microphone array system.

39. Amazon, with knowledge that these products, or the use thereof, infringe the '049 Patent at least as of the date of this Complaint, knowingly and intentionally induced, and continues to knowingly and intentionally induce, direct infringement of the '049 Patent by providing these products to end users for use in an infringing manner. For example, a user utilizing the Amazon Echo products with the "Alexa" command directly infringes at least claim 1 of the '049 Patent.

40. For example, Amazon has and continues to directly infringe at least claim 9 of the '049 Patent by making, using, offering to sell, selling, and/or importing into the United States virtual assistant smart speakers that utilize a microphone array system.

41. Upon information and belief, the Amazon Echo products include a microphone array, which is an array of sound sensors positioned in an arbitrary linear, circular, or other configuration, wherein said sound sensors receive said sound signals from a plurality of disparate sound sources, wherein said received sound signals comprise said target sound signal from a target sound source among said disparate sound sources, and ambient noise signals. An image of

Amazon's Echo product is shown below:<sup>11</sup>



42. Upon information and belief, the Amazon Echo products include a digital signal processor, such as digital signal processors (“DSP”), manufactured by third parties including Texas Instruments, MediaTek, and AMLogic.

43. Upon information and belief, the DSPs included in the Amazon Echo products include a sound source localization unit that estimates a spatial location of said target sound signal from said received sound signals, by determining a delay between each of said sound sensors and an origin of said array of said sound sensors as a function of distance between each of said sound sensors and said origin, a predefined angle between each of said sound sensors and

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<sup>11</sup> <https://www.ifixit.com/Teardown/Amazon+Echo+Teardown/33953>; Annotations in the image originate from <https://www.ifixit.com/Teardown/Amazon+Echo+Teardown/33953>. Green circles indicate the microphones located in Amazon's Echo product.

a reference axis, and an azimuth angle between said reference axis and said target sound signal, when said target sound source that emits said target sound signal is in a two dimensional plane, wherein said delay is represented in terms of number of samples, and wherein said determination of said delay enables beamforming for arbitrary numbers of said array of sound sensors and in a plurality of arbitrary configurations of said array of said sound sensors.<sup>12</sup>

44. Upon information and belief, the DSPs included in the Amazon Echo products include an adaptive beamforming unit that steers directivity pattern of said array of said sound sensors in a direction of said spatial location of said target sound signal, wherein said adaptive beamforming unit enhances said target sound signal and partially suppresses said ambient noise signals.<sup>13</sup> An image of Amazon Echo's sound source localization unit is shown below:<sup>14</sup>

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<sup>12</sup> <https://developer.amazon.com/docs/alexa-voice-service/audio-hardware-configurations.html#hardware>.

<sup>13</sup> *Id.*

<sup>14</sup> <https://thewirecutter.com/reviews/amazon-echo-vs-google-home/>; The beamforming technology is indicated by the light ring in Amazon Echo products which will turn solid blue upon hearing the “wake word” or when it is manually awoken, and a small section of the light ring will turn cyan and point in the direction of the sound. *See* <https://www.amazon.com/gp/help/customer/display.html?nodeId=201601790>; *see also* <https://www.cnet.com/how-to/light-ring-colors-amazon-echo-alexa/>.



45. Upon information and belief, the DSPs included in the Amazon Echo products include a noise reduction unit that suppresses said ambient noise signals for further enhancing said target sound signal.

46. Amazon has and continues to indirectly infringe one or more claims of the '049 Patent by knowingly and intentionally inducing others, including Amazon customers and end-users, to directly infringe, either literally or under the doctrine of equivalents, by making, using, offering to sell, selling and/or importing into the United States products that include infringing technology, such as virtual assistant smart speakers that utilize a microphone array system.

47. Amazon, with knowledge that these products, or the use thereof, infringe the '049 Patent at least as of the date of this Complaint, knowingly and intentionally induced, and continues to knowingly and intentionally induce, direct infringement of the '049 Patent by providing these products to end users for use in an infringing manner. For example, a user utilizing the Amazon Echo products directly infringes at least claim 9 of the '049 Patent.

48. Amazon induced infringement by others, including end users, with the intent to cause infringing acts by others or, in the alternative, with the belief that there was a high probability that others, including end users, infringe the '049 Patent, but while remaining willfully blind to the infringement.

49. Vocalife has suffered damages as a result of Amazon's direct and indirect infringement of the '049 Patent in an amount to be proved at trial.

50. Vocalife has suffered, and will continue to suffer, irreparable harm as a result of Amazon's infringement of the '049 Patent, for which there is no adequate remedy at law, unless Amazon's infringement is enjoined by this Court.

#### **DEMAND FOR JURY TRIAL**

Plaintiff hereby demands a jury for all issues so triable.

#### **PRAYER FOR RELIEF**

WHEREFORE, Vocalife prays for relief against Amazon as follows:

- a. Entry of judgment declaring that Amazon has directly and/or indirectly infringed one or more claims of the '049 Patent;
- b. An order pursuant to 35 U.S.C. § 283 permanently enjoining Amazon, its officers, agents, servants, employees, attorneys, and those persons in active concert or participation with it, from further acts of infringement of the '049 Patent;
- c. An order awarding damages sufficient to compensate Vocalife for Amazon's infringement of the '049 Patent, but in no event less than a reasonable royalty, together with interest and costs;
- d. Entry of judgment declaring that this case is exceptional and awarding Vocalife its costs and reasonable attorney fees under 35 U.S.C. § 285; and

e. Such other and further relief as the Court deems just and proper.

Dated: April 16, 2019

Respectfully submitted,

/s/ Samuel F. Baxter

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